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THE DIAMONDBACK TERRAPINS (*MALACLEMYS*
TERRAPIN) OF PENINSULAR FLORIDA

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As presently understood, three subspecies of diamondback terrapins (*Malaclemys terrapin*) inhabit the coastal waters of the Florida Peninsula and the Florida Keys. As mapped by Carr (1952: 164) the ranges of these three forms are: *Malaclemys t. macrospilota*, Florida west coast; *Malaclemys t. centrata*, Florida east coast, south to about Palm Beach County; *Malaclemys t. rhizophorarum*, Florida Keys, integrating with *M. t. centrata* along the southeastern coast and with *M. t. macrospilota* in the region of Cape Sable.

Recent acquisition of fresh material from the Florida east coast and the coast of South Carolina indicates that the status of the diamondback turtles from the former locality is not as Carr indicated. In addition to material in the collection of the Charleston Museum, I have examined specimens from various institutions, and wish to extend my thanks for the loan of turtles to the following curators of collections: Charles M. Bogert and Richard G. Zweifel, American Museum of Natural History (AMNH); Arthur Loveridge, Museum of Comparative Zoology (MCZ); Archie F. Carr and Duke Wilder, University of Florida (UF); Norman E. Hartweg and William E. Duellman, Museum of Zoology, University of Michigan (UMMZ), and Doris M. Cochran, United States National Museum (USNM). Numerous persons have aided in the collection of specimens of *Malaclemys*, and I wish to thank L. Neil Bell, Julian R. Harrison III, Raymond P. Porter, John A. Quinby, and Ephie C. Seabrook for their assistance. Shell measurements follow Carr (1952), and all measurements are in millimeters.

Malaclemys t. rhizophorarum was described by Fowler (1906) as *Malaclemmys littoralis rhizophorarum*, from a single specimen taken at Boca Grande Key, Monroe County, Florida. Boca Grande lies between Key West and the Marquesas. Carr (1946) resurrected the name *rhizophorarum*, after many years of disuse, for the diamondback terrapins of the Florida Keys, on the basis of a new specimen from Card Sound, Dade County, Florida, and the examination of turtles from the lower portion of the Florida Peninsula. *Malaclemys t. macrospilota* was described by Hay in 1905, from material taken at Charlotte Harbor, Florida, and the Florida West Coast; this Gulf Coast subspecies is readily separable from the Atlantic Coast material by virtue of the clear and sharply differentiated centers of the carapace laminae. *Malaclemys*

t. centrata was first described from Carolina by Latreille in 1801, and later the type locality was restricted to Charleston, South Carolina, by Hay (1905:6).

Examination of specimens from the east coast of Florida demonstrates that this region is inhabited by turtles which cannot be assigned to any of the named subspecies of *Malaclemys terrapin*. The Florida east coast areas were in the past the home of the Tequesta Indians and it seems appropriate to name the new subspecies after these early Americans for whom, almost certainly, the diamondback terrapin was an item of diet. The new subspecies may be known as

***Malaclemys terrapin tequesta*, new sub species**

Holotype: UMMZ 108482, an adult female from Miami Beach, Dade County, Florida, taken June, 1953, by Donald de Sylva.

Paratypes: All from Florida, as follows: *Volusia Co.*, New Smyrna, (USNM 37020) Daytona Beach (UF 4242); *Brevard Co.*, ½ mi. E junction Florida AIA and Florida 520 (UF 6589, UF 6590), 1.3 mi. E Merritt Island (UMMZ 106149, UMMZ 106150), 2 mi. E Merritt Island (UMMZ 106148), 5 mi. E Merritt Island (UMMZ 106151), 5.2 mi. E Merritt Island (UMMZ 106147), Eau Gallie (MCZ 20287); *Indian River Co.*, Sebastian (MCZ 48787).

Diagnosis: A diamondback turtle without strikingly differentiated trans-cen-ter centers or a pattern of concentric circles on the carapace laminae, and without black edging on the seams of the ventral surface of the marginal laminae. Carapace slightly keeled, broad, flattened, and horn-colored, occasionally carapace laminae cleared to show remnants of juvenile pattern; plastron either immaculate or with various dark patterns, either seam following, radiating from the posterior corner of the plastral laminae, or consisting of rectangular black hollow figures on each plastral lamina. Ventral surface of marginal laminae at level of bridge usually without a continuation of the dorsal pattern or with this pattern very obscure and poorly defined, and with a black blotch at the posterodorsal corner of the ventral surface of the marginals at the level of the bridge. Head skin variously mottled or stippled with dark gray on light gray background, but never with dark spots fused into lines. Juveniles usually without concentric rings on carapace laminae and dorsal surface of marginals, rarely with no more than two concentric rings on each lamina; usually each carapace and marginal lamina stippled with gray; if present, one (usually) to five (rarely) dark spots in the center of each lamina. Dorsal tubercles bulbous and either light or dark, that on central lamina 4 most pronounced. Plastron either uniformly lightly stippled with gray, or with each plastral lamina containing a square or triangular hollow dark figure which follows the configuration of the lamina but does not touch the seams.

Distribution: The east coast of the Florida Peninsula, from at least Volusia County south to Dade County.

Description of holotype: An adult female with the following measurements: Carapace length, 178; length of plastron, 157; length of anterior lobe of plastron, 41.0; length of middle lobe of plastron, 53.1; length

of posterior lobe of plastron, 63.2; head width, 37.2; depth, 72; width of posterior lobe of plastron, 82.8; width of bridge, 48.5; greatest width of carapace (at marginal 7), 139.

The carapace is generally dark or horn-colored, the central laminae uniformly so. Each lateral lamina is lighter centrally, and one to several heavy brown spots are visible through the lighter center. The marginals are lighter than the laterals and a bold, open-sided square figure is visible on the dorsal surface of each marginal. The plastron is yellow and the central seam is widely bordered with dark radiating lines. Each plastral lamina shows the remnants of the triangular or rectangular hollow figure noted above as occurring in juveniles, and these plastral figures are somewhat obscured by additional dark pigment. The ventral surfaces of the marginal laminae show a hollow, poorly defined C-shaped figure, the open side directed dorsally, and marginals 4 to 9 on each side have a brown blotch on the posterodorsal corner. The head skin is light gray and boldly spotted with black. The nasal shield is heavily stippled with black, and a black border occurs along its posterior third. The neck and fore limbs are light gray, spotted with black, while the hind limbs and rump are almost uniformly gray. *Variation*: The eleven adult specimens of *M. t. tequesta* (ten females and one male) show little variation compared to the holotype. All are broad and flattened, when compared to *M. t. centrata*, and all have the horn-colored carapace of the type. None shows any indication of the concentric circles on the carapace laminae, persistently characteristic in *M. t. centrata*, and three females (UF 6589, UF 4242, UMMZ 106151) have the centers of the carapace laminae somewhat lighter, so that the remnants of the juvenile pattern (incomplete or diffuse circle or large brown dots) are still visible. All except two (UF 6589, UF 4242) have the dark blotch on the ventral surface of the marginals at the level of the bridge. The head skin is gray and either lightly and uniformly stippled, or with dark spots; the nasal shield varies from pale gray and immaculate, to solid black. The dorsal keels are but slightly tuberculate; the single male (MCZ 48787) has the keel on central 4 more bulbous than those on the preceding two centrals, and likewise more bulbous than the keels of any of the females.

The outline of the shell of *M. t. tequesta* is more nearly oval than that of the remaining Floridian subspecies, and the carapace laminae show conspicuous concentric grooves.

Comparisons: *Malaclemys t. tequesta* requires comparison with the three Floridian subspecies of the genus. The new form can easily be distinguished from *M. t. macrospilota* since the latter has translucent yellowish areas in the centers of the carapace laminae. *M. t. tequesta* shows occasional lightening of the carapace lamina but it is never so pronounced as in *M. t. macrospilota* and the clear areas are not so abruptly differentiated in the new subspecies, the transition between the horn-colored peripheries and the clear centers being very gradual. *M. t. tequesta* is also a broader and flatter turtle than *M. t. macrospilota*, and has a more oval outline than the west coast subspecies. Juveniles of *M. t. macrospilota* differ from those of *M. t. tequesta* in that the carapace laminae of the former subspecies are usually heavily spotted with black and each lamina is heavily black bordered. Concentric

rings are absent on the lateral and central laminae on juvenile *M. t. macrospilota*. If the heavy spotting is absent on the lateral laminae of *M. t. macrospilota*, there is usually a single prominent black spot in the center of each lateral lamina. The bulbous keels on the centrals of juvenile *M. t. macrospilota* are somewhat more pronounced than those of *M. t. tequesta*.

From *M. t. centrata*, *M. t. tequesta* differs in the absence of dark greenish or gray concentric rings on the light gray or green carapace laminae, and the presence of a dark blotch on the ventral surface of the marginal laminae at the level of the bridge. In *M. t. centrata*, the pattern of the dorsal surface of each marginal lamina continues onto the ventral surface of the same lamina as a square or rectangular figure. In *M. t. tequesta*, such ventral continuation of the marginal lamina pattern is either completely absent or is but faintly indicated. The juveniles of these two subspecies are easily differentiated. Juvenile *M. t. centrata* have three or more concentric rings in each lateral lamina, and a complex figure consisting of a combination of stippling and lines and/or rings on each central. The continuation of the marginal pattern from the dorsal to the ventral surface of each marginal lamina, noted in adult *M. t. centrata*, is even more conspicuous in juveniles. In juvenile *M. t. tequesta*, there are never more than two concentric rings in each carapace lamina, and these are poorly defined and occur in only five of sixteen juveniles. The bulbous keels of the centrals are very pronounced in juvenile *M. t. tequesta*, while the keels of juvenile *M. t. centrata* are not bulbous but are rather a linear, almost parallel sided, series. Carr (1952:175) shows an excellent photograph of hatching *M. t. centrata* from Beaufort, North Carolina, and a series of twelve hatchlings from South Carolina and Savannah, Georgia, agree well with his photograph. The expansion of the keels in hatching *M. t. tequesta* is reminiscent of the same condition in juvenile *M. t. macrospilota*.

There are four specimens of *Malaclemys* (other than the type of *M. t. rhizophorarum* from the Florida Keys available to me. One of these (USNM 37021, adult female, Key West) is typical of *M. t. macrospilota*. This individual was taken many years ago and, since it does not agree with the remaining three specimens from the Florida Keys, it is suspected that this individual was captured by commercial fishermen along the lower west coast of Florida and brought to Key West, where it was purchased and later deposited in the United States National Museum. The remaining three specimens (MCZ 1848, adult female, MCZ 1849, adult male, both from the Marquesas, Monroe County, Florida; AMNH 4745, juvenile, from Plantes, Key Long, Monroe County, Florida) differ in detail from *M. t. tequesta* and *M. t. macrospilota*, and are considered to represent *M. t. rhizophorarum*. I am unable to locate 'Plantes, Key Long' on any map; however, there has been, near the present site of the town of Tavernier, a settlement of Planter on Key Largo, and I suspect that the juvenile is really from this locality rather than 'Plantes, Key Long'.

Compared with the figure of *M. t. rhizophorarum* (Fowler, 1906), the two adults from the Marquesas show the black edging on the ventral surface of the marginal laminae (which Fowler considered diagnostic

of *M. t. rhizophorarum*) and the black pigmentation radiating from the plastral seams. This condition occurs in *M. t. macrospilota*, as demonstrated in three adult females (UMMZ 104023, 109544, 109545) from Cedar Key, Levy County, Florida. However, no other specimen shows the fusion of dark spots on the head, giving the head a boldly streaked appearance, as do the two adults from the Marquesas. The juvenile from Key Largo shows the same head pattern condition, and the carapace is also very distinctly marked. Each lateral lamina has a bold, broad, doughnut-shaped figure, hollow on laterals 1 to 3, and solid on lateral 4. Central 1 has a W-shaped black figure, the open end directed anteriorly. The precentral and marginals 1 to 7 have a solid black blotch on the dorsal surfaces, while marginals 8 to 11 have a bold, C-shaped figure, the open end directed toward the periphery of the shell. Centrals 2 to 4 have each a dark bulbous keel, crossed by a black bar. The plastral laminae are boldly spotted, with one to four spots on each lamina. The lateral ends of the pectoral and abdominal laminae each have a large black spot, and the ventral surface of each marginal likewise is marked with a black spot. These markings on the juvenile from Key Largo differ radically from those of any other juvenile examined, and, if characteristic of the populations of *Malaclemys* from the Florida Keys, are sufficiently distinct to separate the key juveniles from those of the mainland. Detailed comparison of this juvenile *M. t. rhizophorarum* with those of *M. t. centrata*, *M. t. macrospilota*, or *M. t. macrospilota*, or *M. t. tequesta* is unnecessary. Adult *M. t. rhizophorarum* can be distinguished from *M. t. tequesta* by the fused and bold head spots, the absence of a dark spot on the ventral surface of the marginal laminae, and the presence of black borders on the ventral surface of the marginals. From *M. t. macrospilota*, the key turtles may be distinguished by the head markings and by the absence of clear centers of the carapace laminae. Much additional fresh material is needed before adequate assessment of the differentiating characters of *M. t. rhizophorarum* can be made. For the present it seems preferable to regard the mangrove terrapin as a distinct subspecies.

Inspection of Table 1 shows that female *M. t. tequesta* average larger in measurements of carapace length, anterior lobe length, posterior length, posterior lobe width, depth, and carapace width; the differences are not striking, however. The ratio of depth over length of posterior lobe of plastron will separate most female specimens of *M. t. centrata* from female *M. t. tequesta*; only two individuals (out of 20) of the former subspecies have this ratio in excess of 1.07, while this ratio in *M. t. tequesta* ranges between 1.07 and 1.19. Likewise, only six specimens of *M. t. centrata* have the ratio of carapace width over posterior lobe length greater than 1.99, while this ratio in *M. t. tequesta* ranges between 1.99 and 2.26. The ratio of depth over posterior lobe length averages equally in female *M. t. tequesta* and female *M. t. macrospilota*, and the ratio of carapace width over posterior lobe length averages less in *M. t. macrospilota* than in *M. t. tequesta*, although the extremes are identical.

Adequate series of males of the Floridian races of *Malaclemys terrapin*, as well as *M. t. centrata*, are not available for comparison.

I have examined nine male *M. t. macrospilota*, three male *M. t. centrata*, and one male each of *M. t. tequesta* and *M. t. rhizophorarum*. On the basis of this limited material, the following observations can be made. Male *M. t. macrospilota* have the light centers of the carapace laminae typical of this race, but old individuals may have this character obscured. In young males the carapace keel is bulbous, especially on centrals 3 and 4, but older individuals have the bulbous terminations less prominent and worn. *M. t. centrata* males show the dark gray or green concentric circles on the carapace laminae and the keel of the carapace is not bulbous, but rather a series of rather sharp carinae occur on centrals 2 to 4, with the keel on central 4 most pronounced. The single male *M. t. tequesta* is almost uniformly horn-colored dorsally, with the lateral laminae only slightly translucent. The dorsal keel is bulbous (especially on centrals 3 and 4), but not so prominent as in male *M. t. macrospilota*. The ventral surface of the marginals at the bridge level have the customary brown blotch typical of the subspecies. The male *M. t. rhizophorarum* is quite dark (almost black) above, and the central keel of the carapace is bulbous on centrals 2 and 4, but less pronounced than in *M. t. macrospilota* and *M. t. tequesta*. The ventral surface of the marginals shows the typical black seams, and the head shows the fusion of blotches characteristic of this subspecies. Measurements and proportions are shown in Table 2. From these data it appears that *M. t. macrospilota* males average larger than those of the three southeastern subspecies, and that male *M. t. centrata* can be separated from male *M. t. macrospilota* on the basis of the ratio of carapace width over length of posterior lobe of plastron. The single male *M. t. rhizophorarum* has a higher ratio of carapace width over length of posterior lobe of plastron than any other male examined, and additional specimens from the Florida Keys may indicate that this ratio will separate key specimens from the remaining Floridian subspecies.

The areas of intergradation between *M. t. tequesta* and *M. t. rhizophorarum* to the south, and between the former subspecies and *M. t. centrata* to the north are unknown. Intergrades between *M. t. tequesta* and *M. t. rhizophorarum* might be expected on the southern coast of Florida and upon the Upper Keys. Carr's (1952:178) specimen from Card Sound, Dade County, may be an intergrade or, judging from the blotchy head markings, may represent *M. t. rhizophorarum*. Determination cannot be made from the photograph, and the specimen cannot presently be located. *M. t. tequesta* is known from Volusia County, Florida and *M. t. centrata* occurs as far south as Glynn County, Georgia. Intergrades between these two forms are expected in the intervening area. Johnson (1952:100) reported a specimen of *M. t. rhizophorarum* from Key Island, south of Naples, Collier County, Florida. I have not examined this individual, but on geographic grounds it would be expected to be referable to *M. t. macrospilota*. Johnson's comment that his specimen represents an immigrant *M. t. rhizophorarum* into an otherwise pure population of *M. t. macrospilota* is a possibility. *Specimens examined* (except paratypes of *M. t. tequesta*)—*M. t. centrata*: South Carolina, Charleston Co., nr. Charleston, 1; Cooper River, North Charles, 1; Charleston, 4; Morris Island, 8; Sol Legare Flats, 7.7

mi. SSW Charleston, 4; Stono River, Edgewater Park 1; Folly Island, 6; Clark's Sound, James Island, 2; Clark's Sound, Folly River, 3; Edisto Island, 1; *Beaufort Co.*, Parris Island, 1. *Georgia, Chatham Co.*, Savannah, 3; *Glynn Co.*, no other locality, 6. *M. t. tequesta: Florida, Brevard Co.*, nr. Melbourne, 2; nr. Merritt Island, 14. *M. t. rhizophorarum: Florida, Monroe Co.*, Planter, Key Largo, 1; Marquesas, 2. *M. t. macrospilota: Florida*, between *Dixie* and *Levy cos.*, mouth of Suwannee River, 12; *Levy Co.*, Cedar Key, 7; *Pinellas Co.*, Passagrille, 1; Gulfport, 3; *Hillsborough Co.*, no other locality, 1; *Manatee Co.*, Bradenton, 1; *Collier Co.*, Marco Island, 4; 3.3 mi. SW Royal Palm Hammock State Park, 1; *Monroe Co.*, Key West (?), 1.

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TABLE 1.

	20 <i>M. t. centrata</i>	11 <i>M. t. tequesta</i>	15 <i>M. t. macrospilota</i>	1 <i>M. t. rhizophorarum</i>
Carapace length	170.0 (140-192)	180.4 (161-200)	178.7 (167-194)	172
Plastral length	153.2 (125-176)	160.5 (144-179)	160.7 (134-177)	155
Anterior lobe length	38.1 (32.8-43.4)	43.5 (37.5-48.9)	40.7 (32.5-44.8)	42.6
Middle lobe length	50.7 (41.1-61.3)	53.0 (44.7-61.1)	55.2 (43.5-64.4)	54.1
Posterior lobe length	63.5 (50.9-74.8)	64.3 (57.9-72.6)	64.1 (55.1-70.0)	57.8
Head width	34.7 (28.4-42.0)	35.4 (32.6-38.6)	36.2 (30.0-39.5)	32.0
Depth	64.4 (56-75)	72.2 (64-80)	72.0 (59-82)	68
Width posterior lobe	81.1 (69.5-90.2)	84.7 (70.5-94.2)	82.4 (71.5-89.7)	73.4
Width bridge	46.2 (37.9-54.4)	50.6 (44.1-57.0)	52.9 (41.0-58.7)	51.7
Carapace width	124.3 (111-141)	137.0 (119-152)	134.4 (110-145)	122.2
D/PLL	1.02 (.92-1.16)	1.12 (1.07-1.19)	1.12 (.99-1.23)	1.18
CW/PLL	1.99 (1.81-2.33)	2.13 (1.99-2.26)	2.09 (1.99-2.23)	2.11

Table 1. Measurements and ratios (means and extremes) of female specimens of four subspecies of *Malaclemmys terrapin*. Abbreviations: D, depth; CW, carapace width; PLL, length of posterior lobe of plastron.

TABLE 2.

	3 <i>M. t. centrata</i>	1 <i>M. t. tequesta</i>	9 <i>M. t. macrospilota</i>	1 <i>M. t. rhizophorum</i>
Carapace length	120.1 (112.8-128.6)	119.4	128.0 (109.4-143.9)	117.0
Pastral length	102.4 (91.4-110.1)	99.4	110.7 (93.9-122.7)	97.7
Anterior lobe length	25.9 (24.0-27.3)	26.0	28.8 (23.7-31.6)	27.0
Middle lobe length	33.4 (29.8-37.1)	30.5	37.0 (30.6-50.2)	32.1
Posterior lobe length	43.9 (37.8-47.3)	42.7	45.4 (39.0-50.2)	38.4
Head width	21.7 (20.7-23.0)	21.6	23.6 (20.6-27.1)	20.5
Depth	43.7 (42-46)	45	47.3 (41-53)	40
Width posterior lobe	53.9 (50.0-57.2)	50.0	57.6 (49.7-64.4)	49.6
Width bridge	30.0 (25.7-33.2)	28.4	35.4 (29.9-40.3)	33.8
Carapace width	87.4 (77.0-93.1)	92.8	95.2 (82.9-107.0)	87.0
D/PLL	1.00 (.91-1.10)	1.05	1.04 (.94-1.11)	1.04
CW/PLL	1.99 (1.97-2.04)	2.17	2.10 (2.05-2.17)	2.27

Table 2. Measurements and ratios (means and extremes) of male specimens of four subspecies of *Malaclemys terrapin*. Abbreviations in Table 1.